



Federal Shipments of Transuranic Radioactive Waste in California

Background

Transuranic wastes are materials that were generated from activities associated with nuclear weapons production research, development, decontamination, and decommissioning of production facilities, since the 1940s. This waste material contains man-made radioactive materials with atomic numbers greater than uranium, such as plutonium, americium, and curium.

Transuranic waste is officially defined as "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste with half-lives greater than 20 years, except for (A) high-level radioactive waste, (B) waste that the Secretary of Energy has determined, with concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the disposal regulations, or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10 Code of Federal Regulations (CFR)."¹ The waste includes laboratory clothing, tools, glove boxes, leaded rubber gloves, glassware, air filters, ash salt metals, ceramic parts, plastics, soils, and solidified waste. Some of the waste also contain hazardous chemicals (e.g., carbon tetrachloride, lead, toluene, and xylene) and are classified by the U.S. Environmental Protection Agency (EPA) as "mixed" transuranic waste.

The United States (US) Department of Energy (DOE) is responsible for transporting defense-generated transuranic (TRU) radioactive waste from DOE facilities throughout the US to a permanent geologic disposal facility, called the Waste Isolation Pilot Plant (WIPP)² in southern New Mexico, 26 miles east of Carlsbad. The WIPP facility is located 2,150 feet underground in geologic salt deposits.

Recognizing that Western corridor states have the responsibility for ensuring the safety of their residents and responding to incidents, Western Governors have unanimously adopted several related policy resolutions addressing the safety of WIPP shipments.³ The objective of these resolutions is the safe and uneventful transportation of nuclear waste from current temporary

¹ PUBLIC LAW 102-579 THE WASTE ISOLATION PILOT PLANT LAND WITHDRAWAL ACT. Retrieved from <http://www.wipp.energy.gov/library/CRA/BaselineTool/Documents/Regulatory%20Tools/10%20WIPPLWA1996.pdf>.

² <https://www.wipp.energy.gov/>.

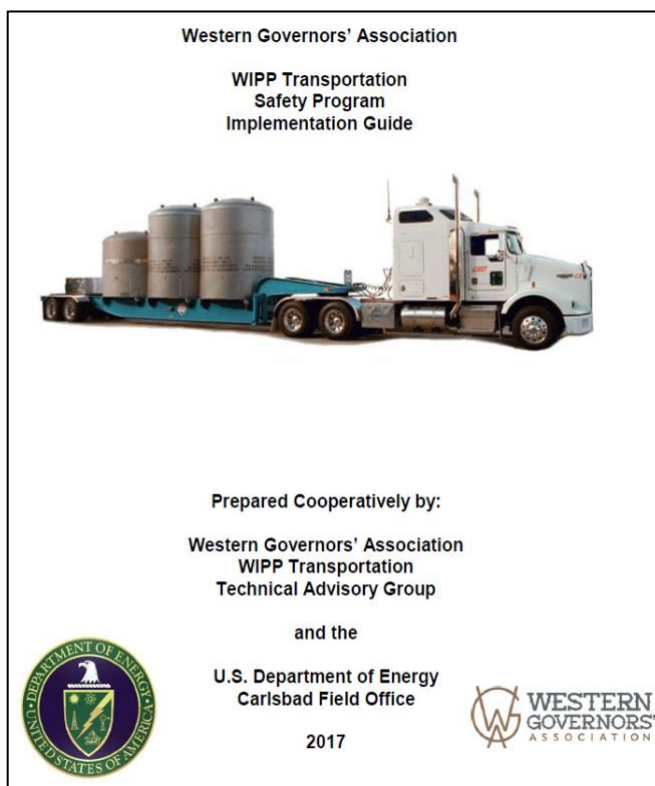
³ Western Governors' Association WIPP webpage, <http://westgov.org/explore/waste-isolation-pilot-plant>.



storage facilities to more suitable interim or permanent repositories. Western Governors are committed to working with Congress and the DOE to achieve this objective.

In 1989, the Western Governors' Association (WGA) established its Technical Advisory Group (TAG) to work toward achieving this objective. The Technical Advisory Group originally consisted of representatives from seven Western states along the initial transportation corridor to the WIPP: New Mexico, Colorado, Wyoming, Utah, Idaho, Oregon, and Washington. The Technical Advisory Group was later expanded to include Arizona, California, Nebraska, Nevada, Texas, and Wyoming since these states are impacted by inter-site shipments or shipments to the WIPP.

Figure 1: 2017 WGA WIPP Transportation Safety Program Implementation Guide. The Western Governors' Association (WGA) Waste Isolation Pilot Plant (WIPP) Transportation Technical Advisory Group (Technical Advisory Group), in cooperation with the U.S. Department of Energy (DOE), developed this *WIPP Transportation Safety Program Implementation Guide* (Guide). It presents the overall transportation issues, objectives, approaches and procedures, which were agreed to by Western corridor state Governors and DOE through Memorandums of Agreement signed in 1995, 2003, and 2009. These issues, objectives, approaches and procedures govern the conduct of the highway transportation of transuranic waste through Western states.



Previous California TRU Shipments

Since 1999, DOE has shipped TRU waste by truck from twelve DOE sites for permanent disposal at WIPP. Since 2002, DOE has completed 115 truck shipments of TRU waste in California. These include 98 shipments directly to WIPP from Lawrence Livermore National Laboratory (LLNL) (18 contact-handled shipments from October 2004 through January 2005), from the GE Vallecitos Nuclear Center (32 remotely handled shipments in 2010), and from the Nevada Test Site (48



contact-handled shipments from January 2004 through November 2005). In addition, DOE transported two shipments of remotely handled TRU waste in 2002 from the Energy Technology and Engineering Center in southern California to Hanford, Washington, one shipment of contact-handled waste from the Lawrence Berkeley National Laboratory to LLNL in 2004, and two shipments of contact-handled waste from Site 300 to LLNL (one in 2004 and one in 2010).

In June 2010, DOE began transporting shipments of contact-handled (CH)-TRU waste from LLNL to Idaho National Laboratory (INL) over a new northern California route via Interstate 80 over Donner Summit. The former route through southern California to WIPP was officially closed in 2011. DOE transported 12 shipments from sites in California to INL in 2010 including 1 CH-TRU waste shipment from GEV, 1 CH-TRU waste shipment from the Lawrence Berkeley National Laboratory, and 10 CH-TRU waste shipments from LLNL to INL.

Description of the Waste and Its Risks

Most of the waste planned for transport in California is CH-TRU waste, which means the radiation it emits is not very penetrating and does not require lead or other types of heavy shielding to protect workers or the public. These containers can be handled with minimum protective gear. However, remote-handled (RH)-TRU waste emits penetrating radiation and therefore requires heavy shielding. Inhalation and ingestion are the primary radiation hazards posed by TRU waste. Even in very small quantities, certain transuranic materials, such as plutonium, can deliver significant internal radiation doses if taken into the body.

- Most of the TRU waste in California is generated at LLNL. Initially, until the spring of 1990, LLNL waste was trucked to NTS for storage. However, since that time, TRU waste generated at LLNL is stored onsite until it can be transported to WIPP or INL.
- DOE estimates there will be over 37,000 shipments from 10 major DOE sites and several smaller DOE facilities to WIPP during a 35-year period between 1999 and 2034. There have been over 12,433 shipments to WIPP since these shipments began in March 1999. WIPP shipments travel through at least 22 states and the lands of at least 11 tribal governments.

California's Policy on TRU Waste Shipments

Since 1989, California's Governor designated the California Energy Commission (Energy Commission) as the lead state agency for planning the proposed DOE shipments of TRU waste in California. The Energy Commission is responsible for coordinating activities of other state agencies that will be involved with the WIPP shipments. These agencies include the California



Highway Patrol (CHP), the California Governor's Office of Emergency Services (Cal OES), the California Department of Public Health - Radiologic Health Branch, the California Environmental Protection Agency, the California Department of Fish and Game, the California Department of Transportation, and the California Public Utilities Commission Rail Safety Branch. The Energy Commission and these agencies have prepared several background papers and provide comments on WIPP transportation safety issues and policies.

Along with ten other western states, California has been actively involved since 1989 in the efforts of the Western Governors' Association (WGA) and DOE to cooperatively develop a comprehensive safety program for shipments to WIPP. As part of the WGA-DOE safety program, the Energy Commission has coordinated California's input to federal plans and policies for these shipments. The Energy Commission has prepared background information to inform Californians of DOE's shipment plans, the WGA WIPP transport accident prevention and emergency preparedness program, and California's issues and concerns.

Shipping Containers

- Two shipping containers, the TRUPACT-II (Transuranic Packaging Transporter) and Half PACT, are used for transporting CH-TRU waste to WIPP for permanent disposal. In addition, two containers, the RH-72 B and CNS 10-160B, are used for RH-TRU waste transport. TRUPACT-II is an extremely sturdy, reusable shipping cask. Inside the TRUPACT-II, the waste is packaged in 55-gallon steel drums or steel boxes. Each TRUPACT-II holds up to 14 55-gallon drums or 2 boxes. A WIPP tractor-trailer typically carries three TRUPACT II containers per truck, although some may carry fewer containers. In addition, a Half PACT is used for contact-handled shipments and holds up to seven 1000-pound waste drums. All RH-TRU waste is transported in one of two casks, the CNS 10-160B cask or the RH-72 B cask. The RH-TRU waste from GE Vallecito was shipped in the RH-72B cask (3 drums of waste per shipment). The cask is shielded by lead and protected by impact limiters at both ends of the cask. RH-TRU waste has a higher radiation dose rate than CH-TRU waste at the surface of the shipping container, but, when transported, the RH-TRU waste and the CH-TRU waste have the same dose rate limit on the outside of the shipping cask due to the increased shielding in the RH cask.
- The US Nuclear Regulatory Commission has approved these shipping casks, issuing a certificate of compliance for TRU waste transportation.⁴ The casks are built to withstand

⁴ Information available at NRC PART 71—PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL, <https://www.nrc.gov/reading-rm/doc-collections/cfr/part071/full-text.html>, and Directory of Certificates of



severe accidents without releasing their contents, as confirmed by a series of stringent tests.

- Shipments to WIPP are required to be placarded, per US Department of Transportation (DOT) requirements, if: (1) the load contains a Highway Route Controlled Quantity of radioactive material, or (2) the radiation level from the package exceeds 50 millirem/hour on contact or 1 millirem/hour at one meter from the package's surface.

Contract Carrier

- The DOT sets standards for drivers of trucks that carry hazardous materials. DOE, recognizing the heightened public interest in radioactive material shipments, agreed to go beyond (exceed) these regulations for its WIPP drivers and carriers.
- DOE adopted rigorous driver and carrier performance requirements to ensure that only high quality drivers and trucks are used for WIPP shipments. The drivers must have extensive, accident-free experience and are tested for drug and alcohol abuse. States conduct regular safety audits of the carriers.

Safety Inspections

- State safety inspectors using enhanced truck safety inspection standards inspect all TRU waste shipments. These inspections take place before the trucks leave DOE sites and are periodically done along the route.
- Trucks must be in top working condition. Inspections include driver's logs, brakes, tires, lights, turn signals, cask tie downs and other items. Radiation surveys of the shipping containers are done to ensure that they meet radiological safety standards.

Accident Prevention and Emergency Response

- Over 90 percent of the TRU waste is located in western states. The WGA and DOE have worked together over the past two decades to develop a transportation safety and emergency response program, including a set of transport safety and emergency response protocols that exceed federal safety requirements. These protocols have been approved and endorsed in a Memorandum of Understanding between the WGA and the US Secretary of Energy for use in these shipments. The protocols include use of specially trained drivers, truck and cask inspections, shipment tracking (using satellite-based tracking and communication systems), weather and road condition checks prior to

Compliance for Radioactive Materials Packages (NUREG-0383), <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0383/>.



departure, safe parking, route selection protocols, training for state and local emergency responders, and emergency response plans.

California's Preparation

- Since 1989, California's preparation for TRU waste shipments to WIPP has been through an interagency working group of state agencies called the California Nuclear Transport Working Group (Working Group), coordinated by the Energy Commission. The Governor designated the Energy Commission to represent California on the WGA WIPP Technical Advisory Group (TAG) in 1990.
- The Working Group is comprised of senior staff from eight California agencies with regulatory authority or operational responsibilities with respect to radioactive material shipment safety and emergency response: the Department of Fish and Game, Department of Public Health, Department of Transportation, Energy Commission, Environmental Protection Agency, Highway Patrol, Emergency Management Agency, and the Public Utilities Commission Railroad Safety. These state agencies, in cooperation with the WGA and the DOE, have prepared a California Waste Isolation Pilot Plant (WIPP) Emergency Response Plan and Transportation Procedures, which is updated by Cal EMA, for these shipments.
- To help ensure that these shipments are conducted safely and that emergency response preparation is in place, the following is being done:
 1. Shipment Inspections and Escorts: CHP inspects all shipments originating in California and escorted the initial shipments in California. Prior to departure, trucks and casks must pass a rigorous vehicle safety inspection by CHP inspectors and DOE.
 2. Emergency Preparedness: Cal OES coordinates planning and emergency response preparation for WIPP shipments. Since 2000, California has received funding to plan and prepare for these shipments. Funds have been used to develop state plans for responding to an accident involving TRU waste shipments, to train inspectors for shipment inspections, and to train and equip state and local emergency responders along shipment routes in California. Emergency response training and radiological detection instruments have been provided to public safety personnel in counties along the routes.
 3. Routes and Advanced Notification: CHP is the lead agency for designating routes for highway radioactive material shipments, is the Governor's designee for advance notice of specified radioactive material shipments, and represents California on the Security Subcommittee of the WGA WIPP TAG.



4. **Shipment Tracking:** Shipments are tracked by Cal OES and CHP using the DOE TRANSCOM satellite-based tracking and communication system. TRANSCOM users, which include authorized DOE, state, and tribal users, have the ability to track shipments, shipping schedules, bills of lading, and emergency response information.
5. **Bad Weather and Road Conditions:** TRU waste shipments must be planned to avoid adverse weather or bad road conditions. Weather and road condition checks are conducted prior to departure. The California Department of Transportation and CHP provide information on road and highway conditions along the routes through California. CHP has identified safe parking areas along shipment routes for use in the event of bad weather or road conditions during transit in California.
6. **Schedule Shipments to Avoid Peak Tourist Events:** Shipments are scheduled to avoid holidays, peak traffic congestion periods, and peak tourist events along routes.

California Routes

- Under WGA/DOE protocols, DOE is required to identify routes that are acceptable to the states along the routes prior to shipments. DOE has agreed with states to follow the US Department of Transportation routing guidelines for radioactive material shipments. DOE primarily uses the interstate highways for WIPP shipments and consults with states regarding the use of routing alternatives. DOE has only used alternate routes for WIPP shipments that were agreed to or designated by states.
- In 1999, California officials objected to DOE's increasing use of predominantly California routes in southeastern California via State Route 127 for shipments of nuclear waste to NTS from federal facilities in eastern states. There are shorter, more direct, and better quality alternate routes in Nevada, to and from NTS, that have more timely emergency response capability than California routes in that region.
- DOE originally planned to begin shipments from NTS through California to WIPP in July 2003, using routes that California officials opposed by filing formal objections. However, DOE postponed these shipments, following requests by WGA and Senator Dianne Feinstein for DOE to postpone these shipments to allow time for further routing negotiations among DOE, WGA, California, Nevada and other affected states.
- WGA mediated negotiations between the affected states and DOE regarding these routes. In the spirit of cooperation, California, through WGA, offered a compromise that would allow DOE to use the California route via State Route 127 for the first half of the



NTS to WIPP shipments, as long as DOE and states agreed to an alternate route and timetable for the second half of shipments. California further conditioned these shipments upon DOE's agreeing to certain terms: 1) the first set of shipments would be completed in 2004, 2) the second set of shipments would exclude predominantly California routes, and 3) no large quantity shipments, called "highway route-controlled quantity shipments", would use this route without California's prior approval.

- DOE began shipments from the NTS through California to WIPP in January 2004. DOE then halted the NTS shipments to allow time for further waste characterization to certify the waste's compliance with WIPP acceptance criteria. DOE then resumed shipments in late summer 2004. DOE began the shipments from LLNL to WIPP in October 2004 and completed the initial set of shipments from NTS and LLNL to WIPP in 2005. These LLNL shipments, as well as the GEV shipments, to WIPP used the I-5 corridor south through Bakersfield, State Route 58 to I-40 to Arizona. DOE began shipments from LLNL and 1 GEV shipment in June 2010 to the INL using a new northern California route via Interstate-80 over Donner Summit. As of 2019, the only open WIPP route is along Interstate-80 over Donner Summit.